

Engineering Safety Notes

and

Operational Safety Procedures

for

Pressure Vessels and Systems

(A Guide)

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(Revision 2/89)

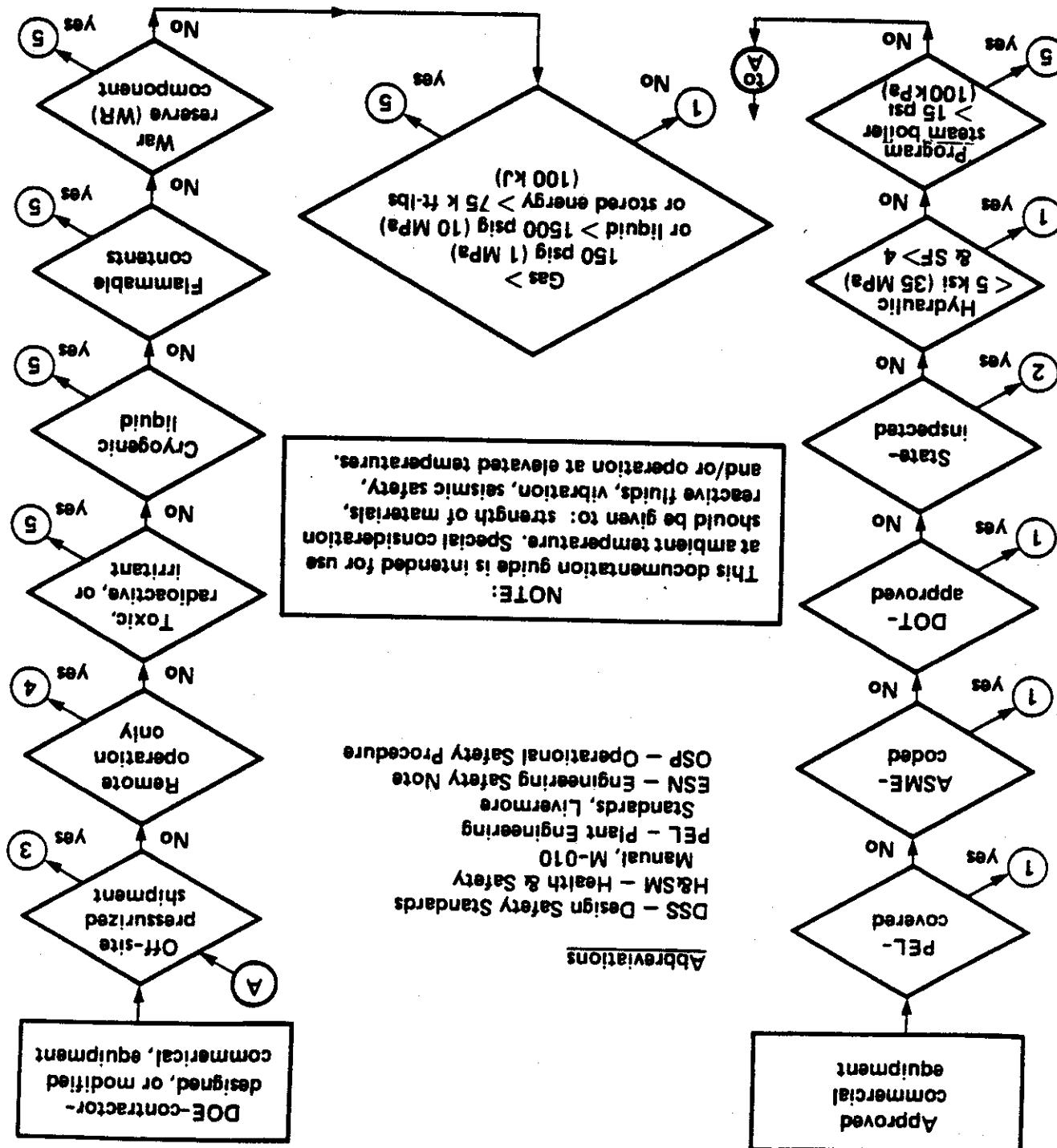


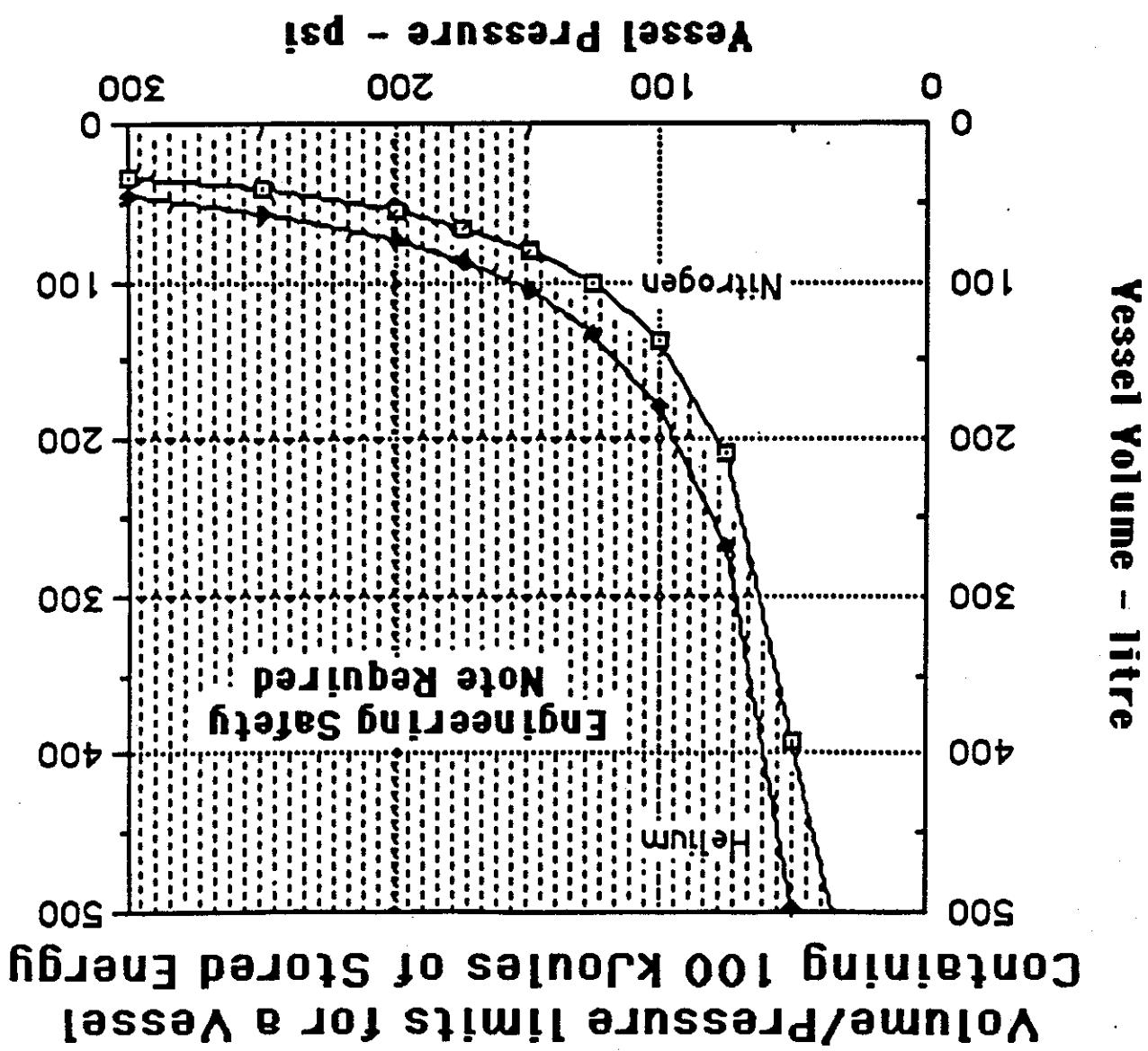
- Ch. 4. An OSP may be required by H&SM Ch. 2.
Ch. 4. No ESN required for the pressure equipment, but comply with DSS

3. Requires DQI approval of DOE-SAN exemption

- 1. No ESN or OSP required (documented or hazards are low). Go to A
 - 2. No ESN or OSP required, but notify PE facility operations. Go to A

Documentation requirements





Content of Engineering Safety Note

- A. Description
- B. Hazards
- C. Calculations
- D. Pressure Testing
- E. Labeling
- F. Associated Procedures
- G. References
- H. Signature Authority
- I. Distribution

A. Description:



What is it?

Physical size?

What will it be used for?

What is its pressure rating?**

Manned area or remote?

Is it an ASME coded vessel?

Is it a D.O.T. coded vessel?

Are there drawing numbers or sketches you can reference?

**M.A.W.P. Relief device setting.

M.O.P. Operating pressure 10 to 20% below M.A.W.P.

A. Description: (continued)

Where will it be located?

Building _____ Room _____

Responsible experimenter or user

From your description could you find this vessel or
system 3 years from now?



B. Hazards

What are the hazards:
Stored energy?

$$E = \frac{P_1 V_1}{k-1} \left[1 - \left(\frac{P_2}{P_1} \right)^{\frac{k-1}{k}} \right]$$

Marks Handbook
7th Edition (Page 4-25)

- K = value for nitrogen 1.4
- K = value for helium 1.66
- K = value for argon 1.67
- K = value for hydrogen 1.41



Stored energy calculations require consistent units

$$E = C \left\{ \frac{P_1 V_1}{K-1} \left[1 - \left(\frac{P_2}{P_1} \right)^{\frac{K-1}{K}} \right] \right\}$$

E Joules ft.lbs.
(Energy) gms TNT lbs. TNT

P MPa psia
(Pressure) psia psia

V cc in³
(Volume) cc ft³

C 1 8.33 x 10⁻² 1.492 x 10⁻⁶ 9.22 x 10⁻⁵

B. Hazards (continued)

Manned area, remote use only, radioactive,
toxic/corrosive?

If your toxics are in a hood what happens in a
power outage?

What are you going to do to eliminate or lessen
the hazards, i.e.:

hood, barricades, protective clothing,
special operating procedure.



C. Calculations:

For commercial components:

- All components rated at or above M.A.W.P., therefore, no calculations are required.
- Reference manufacturer's ratings, stores catalog ratings.
- List of materials or part numbers.



C. Calculations (continued)



For vessels/structures:

Include calculations on:

- Weld shear stress
- Tensile stress on bolts, plates
- End closures
- Hoop stress
- Thread shear
- Safety factor
- Remote operation only - calculations on the barricading or shielding used.

D. Pressure Testing:



All pressure testing requires a test procedure.

Use this section to write the test procedure.

Specify: test sequence, test pressure, test fluid, hold time, acceptable leak rate.

Retest

You may also want to include the retest procedure. It may be different than the original procedure. You may want to change the frequency of inspection or retest.

E. Labeling:

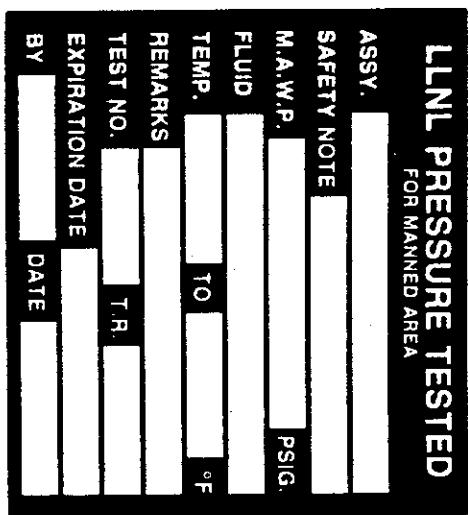


Figure 32-1. Pressure tested label (black on silver).

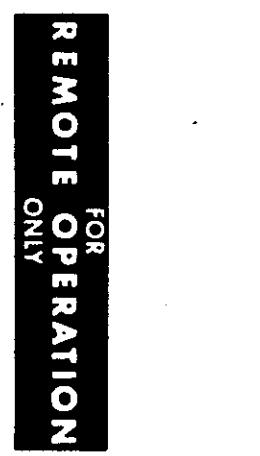


Figure 32-2. Remote operation label (silver on red).

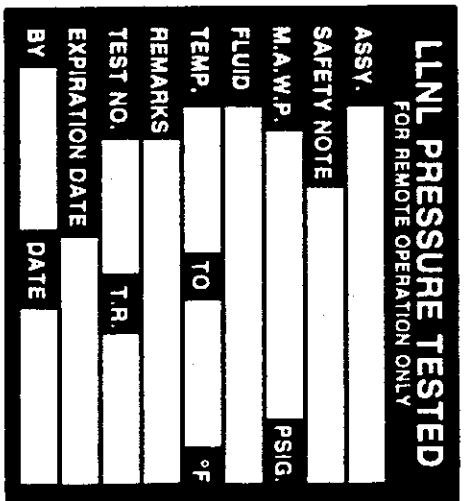


Figure 32-3. For remote operation only (silver on red).

- High Pressure Laboratory test request number electro etched on part?
- Assembly number etched on part?

E. Associated Procedures:

Building Procedure (FSP 231--)

Operating Procedure (OSP 231--)

Special Instructions (referenced)



G. References:

Examples:

1. Marks Handbook 7th Edition (Pg 4-25)
2. Mechanics of Materials, Miller and Doeringfeld,
Chapter 16
3. M. E. Safety Note ENS 78-954, L.L. Dibley
4. Health & Safety Manual Supplement 32.03, Pg. 13
5. Formulas For Stress and Strain, Roark, 3rd Ed.

Signature Authorization



Prepared by: _____

Responsible Designer

Reviewed by: _____

Pressure Consultant

Approved by: _____

Division Leader

Approved by: _____

Deputy Associate Director*

* Brittle materials or S.F. of less than 3

Recommended Distribution



Applicable management/supervision

Pressure Consultant

Industrial Safety Representative

Pressure Safety Representative

Responsible Designer

Central Library/Files

(others concerned, including Building Coordinator)